Manual of Operation and Instruction

Model 2701-B
PaveTracker™ Plus

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NOTE

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HOW TO USE THIS MANUAL

Congratulations on the purchase of the **Troxler Model 2701-B PaveTracker™ Plus**. Troxler, the leader in density gauge technology, now offers the PaveTracker Plus, an electromagnetic sensing device that quickly gives an indication of the density of asphalt pavement.

The *Model 2701-B Manual of Operation and Instruction* contains information on safely using this gauge. Also included in this manual are safety warnings, gauge setup, troubleshooting, and general maintenance.

CONVENTIONS USED IN THIS MANUAL

Throughout this manual, symbols and special formatting are used to reveal the purpose of the text as follows:

WARNING
Indicates conditions or procedures that, if not followed correctly, may cause personal injury.

CAUTION
Indicates conditions or procedures that, if not followed correctly, may cause equipment damage.

NOTE
Indicates important information that must be read to ensure proper operation.

⟨KEY⟩ Angle brackets and a different typestyle indicate a key or character (number or letter) to press on the gauge keypad. For example, "Press ⟨**STORE**⟩" means to press the key labeled *STORE*.

DISPLAY A different typestyle is used in text to indicate information or messages displayed on the gauge.

```
DISPLAY - Typestyle
and shading used to
simulate PaveTracker
display
```

♦ Diamonds indicate a list of things needed (such as equipment) or things to know.

✓ Check marks indicate the performance of an action. With lists of check marks, follow the instructions in the order of the check marks.

▶ Triangles indicate that more than one option is available. Carefully select the option that applies.

EU DECLARATION OF CONFORMITY

Application of Council EMC Directive 89/336/EEC.

NOTE

The Low Voltage Directive 73/23/EEC does not apply to the Model 2701-B PaveTracker Plus gauge because there are no voltages greater than 75 V dc that are accessible by the operator.

Standards to which Conformity is Declared:

EN 55011:1998+A1:1999+A2:2002 – Industrial, Scientific, and Medical (ISM) Radio Frequency Equipment

EN 61326:1997+A1:1998+A2:2001+A3:2002 – Electrical Equipment for Measurement, Control, and Laboratory Use

Manufacturer: Troxler Electronic Laboratories, Inc.
P.O. Box 12057, 3008 Cornwallis Road
Research Triangle Park, North Carolina
27709 U.S.A.

Apparatus: Model 2701-B PaveTracker Plus

Year of Declaration: 2006

FCC REGULATIONS

Troxler's Model 2701-B PaveTracker™ Plus has been tested and found to comply with the limits for Industrial, Scientific, and Medical Devices pursuant to Part 18 of Federal Communications Commission (FCC) Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not used in accordance with this instruction manual, may cause harmful interference to radio communications. Operation of the equipment in a residential area may cause harmful interference. It is advised that operation in residential areas be as brief as practicable to minimize the potential for interference.

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CHAPTER 1

INTRODUCTION TO THE MODEL 2701-B

This chapter provides a brief overview of the Troxler Model 2701-B PaveTracker™ Plus, and includes a list of the gauge parts and accessories, and instructions for unpacking and inspecting the gauge.

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INTRODUCTION

Troxler, the leader in density gauge technology, now offers the Model 2701-B PaveTracker Plus (see Figure 1–1), an electromagnetic sensing device that quickly gives an indication of the density of asphalt pavement. The advanced technology in the patented PaveTracker Plus allows rapid and reliable measurements. The PaveTracker Plus can be used on existing asphalt pavements or on freshly placed mats. The unit is ideal for performing quick quality control measurements to check for segregation, areas of low density, and overall pavement uniformity.

The PaveTracker Plus is a precision device that is designed to provide many years of trouble-free service. As any precision device, the PaveTracker Plus requires reasonable care and maintenance to ensure its accuracy and reliability. The user should:

- Keep the unit clean and free of all road debris.
- Return the unit to Troxler for yearly re-calibration and inspection.
- Ensure that the unit remains sealed at all times. There are ***no field-serviceable components*** inside the unit. Opening the case will affect the integrity of the unit and therefore will void the warranty.

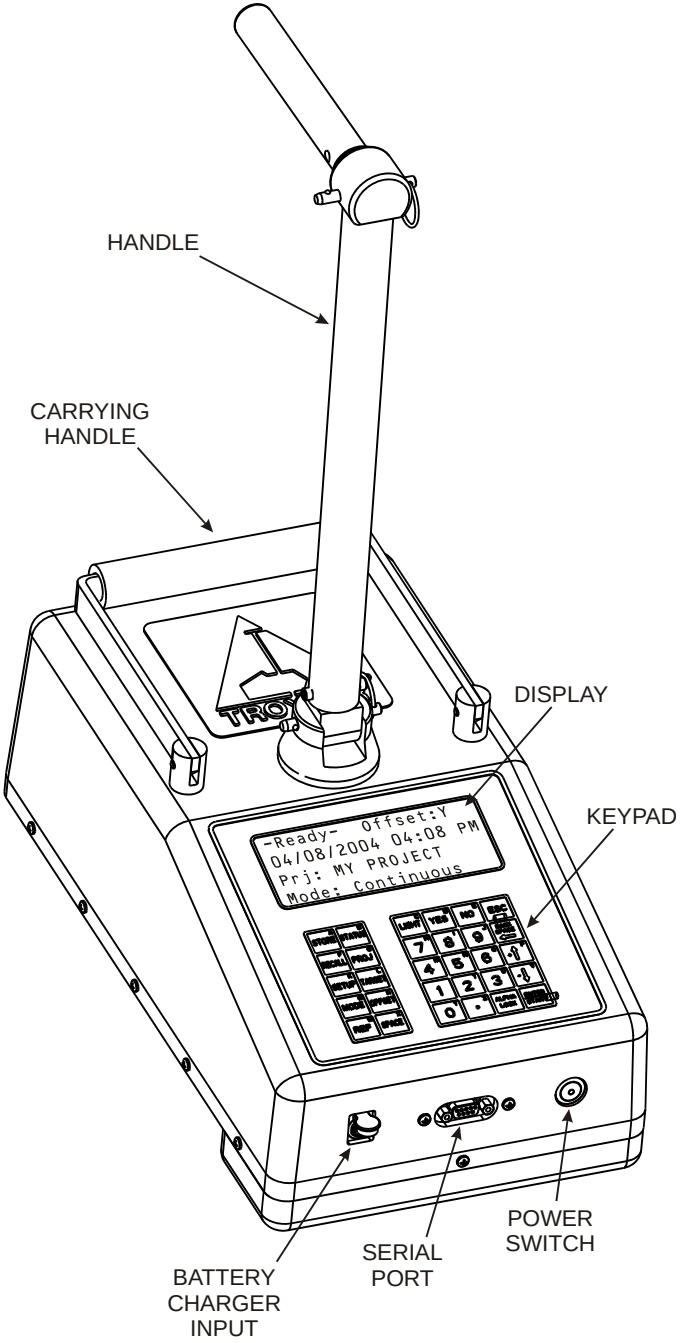

Figure 1–1. Model 2701-B PaveTracker Plus

FEATURES

The PaveTracker Plus (see Figure 1–1) incorporates a number of features that provide unmatched efficiency, usability, and flexibility.

The PaveTracker Plus takes density measurements using *electromagnetic sensing technology*, eliminating the need for government licenses or special training. Measurements are completed within 2 seconds, saving time and money.

The unit's memory can store approximately 1000 readings for later viewing, printing, or downloading.

Both the 30-button *keypad* and 4 x 20 liquid crystal display (LCD) screen are *backlit*, making them easy to see, day or night.

The gauge includes a replaceable, protective, adhesive-backed *bottom cover disc* on its bottom surface. The protective cover provides thermal protection for the gauge's internal components and protects the bottom surface of the gauge against wear.

The *carrying case* for the Model 2701-B includes a built-in *reference standard*, which provides a density measurement standard for taking reference readings.

The PaveTracker Plus's advanced software provides three test modes (*continuous*, *averaging*, and *segregation*) for greater flexibility and multiple applications. The software also provides automatic calculations (*average density*, *percent maximum density*, *percent air voids*, and so on) for greater ease of use.

The gauge allows the operator to specify the *layer thickness*; the value entered is stored with other measurement data.

Gauge measurements can be adjusted using a *density offset* or *mix calibration* (which includes slope and intercept values) to increase accuracy on specific materials.

Both an *ac charger* and a *dc adapter* are included with the PaveTracker Plus, enabling the unit to be recharged from an ac outlet or a 12 V dc system.

The gauge features two audible indicators, an internally mounted *beeper*, as well as a louder, external one mounted on its underside. The internal beeper emits a short tone in response to a valid keystroke on the keypad. It sounds a longer tone when the operator presses an invalid key or if the gauge displays an error message. The external beeper performs the same functions, and can be enabled or disabled as desired by the operator.

A *serial communications port* is mounted on the front of the gauge. The serial port is used to output data to a serial device, such as a computer or printer.

The gauge features two handles. The right-angle handle is used to move and position the gauge while taking measurements. A second *carrying handle* is provided for ease of transporting and positioning the gauge. An optional *telescoping handle* (PN 113017) is also available.

GAUGE PARTS AND ACCESSORIES

1. The **gauge** is the portable electromagnetic sensing device containing all electronic modules and a rechargeable battery pack.

2. The **carrying case** for the Model 2701-B includes a built-in **reference standard**, which provides a density measurement standard for taking reference readings.

3. The **ac charger** and **dc adapter** are used to charge the gauge batteries. The ac charger accepts 100 – 240 V ac, 47 – 63 Hz and supplies 12 V dc at 1.8 A. The dc adapter allows recharging from a 12 V dc system, such as a vehicle cigarette lighter.

4. The **manual** (not shown) details how to operate and maintain the gauge.

5. A **printer** (optional, not shown) connects to the gauge for printing data.

UNPACKING AND INSPECTION

NOTE

To ensure the safe return of the PaveTracker Plus to Troxler for repair or maintenance, please keep the original shipping boxes and all packing materials.

Upon receipt of the gauge from the factory:

1. Perform a complete inspection and inventory. If the shipping case and/or any other part or accessory appears damaged, notify the carrier and your Troxler representative **immediately**.

2. Check the shipping case for the following:

   - Model 2701-B PaveTracker Plus
   - Carrying Case (PN 113034)
   - Handle (PN 113210)
   - AC Charger (PN 110403)
   - DC Adapter (PN 104156)
   - 2701-B Cover Kit (PN 113107), containing replacement bottom covers and cleaning wipes
   - Manual of Operation and Instruction (PN 113045)

3. Lift the gauge from the carrying case and inspect the outside surface for damage.

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CHAPTER 2

GETTING STARTED

This chapter provides details on getting started with the Model 2701-B PaveTracker Plus. It describes the gauge keypad, and provides instructions for turning the gauge on, and setting up the gauge.

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KEYPAD

The Model 2701-B keypad (Figure 2–1) allows the operator to access the gauge software. Troxler designed the keypad for ease of use, with large keys and an anti-glare coating. Note that the function keys are available only when the **Ready** screen is displayed. Table 2–1 describes the function of each key.

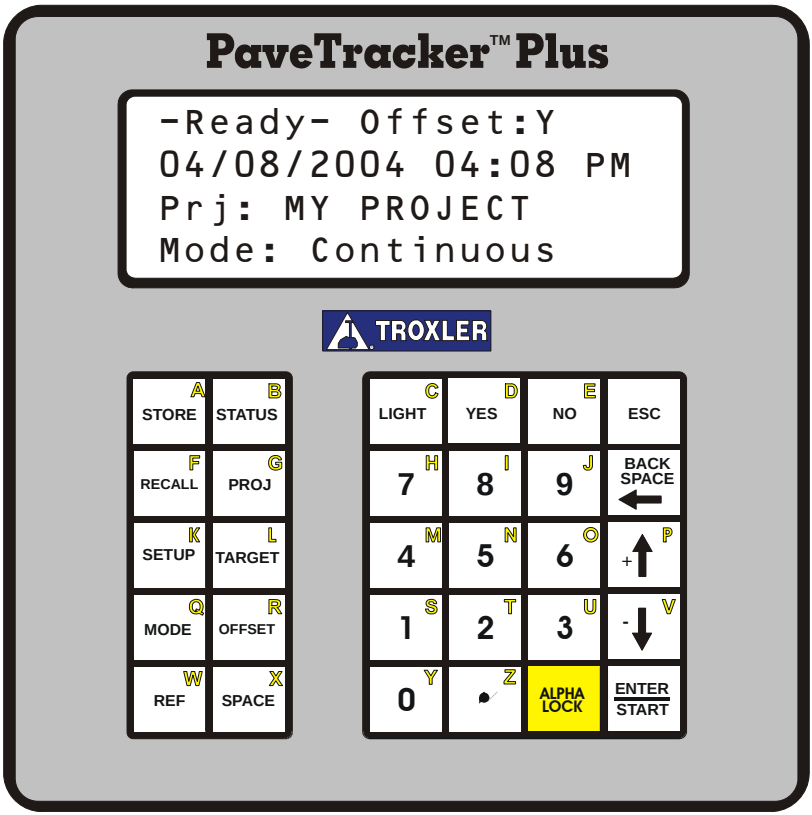


Figure 2–1. Model 2701-B Keypad

Table 2–1. Model 2701-B Keypad Functions

KEY	FUNCTION	PAGE
⟨**STORE**⟩	Store the most recent data in the current project file.	5–8
⟨**STATUS**⟩	Displays gauge status information.	2–6
⟨**RECALL**⟩	Display the most recent data.	4–12
⟨**PROJ**⟩	Select or create a project file and view, output, or erase project data file.	5–2
⟨**SETUP**⟩	Displays the gauge **Setup** menu.	2–7
⟨**TARGET**⟩	Select, enter, or disable a Gmb (Marshall) or Gmm (Voidless density) value.	2–14
⟨**MODE**⟩	Select the measurement mode, *Averaging*, *Continuous*, or *Segregation*.	2–16
⟨**OFFSET**⟩	Enable, disable, or change a density offset.	3–3
⟨**REF**⟩	Take a reference reading.	4–2
⟨**SPACE**⟩	Enter a space.	
⟨**LIGHT**⟩	Manually toggle the keypad and LCD backlights on and off.	2–5
⟨**YES**⟩	Respond *yes* to *yes/no* questions.	
⟨**NO**⟩	Respond *no* to *yes/no* questions.	
⟨**ESC**⟩	Return the display to the **Ready** screen without storing or updating the data.	
⟨**0**⟩ .. ⟨**9**⟩	Enter numbers and access menu options.	
⟨**.**⟩	Enter a decimal point.	
⟨**ALPHA LOCK**⟩	Access the letters.	
⟨**BACK SPACE**⟩	Moves cursor back one space.	
⟨↑⟩, ⟨↓⟩	Scroll through menu options or view screens.	
⟨**ENTER/START**⟩	Accept data entry or begin a measurement.	
⟨**A**⟩ .. ⟨**Z**⟩	Enter letters. Access these keys by first pressing ⟨**ALPHA LOCK**⟩.	

TURNING THE PAVETRACKER PLUS ON

To turn on the PaveTracker Plus, press the power switch located on the front panel next to the serial port (see Figure 1–1).

NOTE

To turn off the PaveTracker Plus, press *and hold* the power switch for two seconds.

The gauge displays the model number, battery voltage, software version, and unit serial number as shown below:

```
   -Model 2701B-
Battery Volts: X.X
  V#.## SN: ###
   Press <ENTER>
```

Press the ⟨**ENTER/START**⟩ key to continue. The software performs two tests to ensure that the gauge is working properly. The gauge first performs a brief self-test, followed by a test of the display.

Following the test period, the gauge displays the **Ready** screen:

```
-Ready- Offset:YES
mm/dd/yyyy hh:mm AM
Prj: PROJECT NAME
Mode: Continuous
```

The operator can access any gauge function from the **Ready** screen. On the first line, the **Ready** screen displays whether a density offset (see page 3–3) or mix calibration (see page 3–6) is enabled.

The second line shows the current date and time. The third line shows the current project (see page 5–2), if any. The last line shows the measurement mode (see page 2–16).

The PaveTracker Plus features a backlit keypad and display. To toggle the backlights on and off, press the ⟨**LIGHT**⟩ key.

NOTE

The keypad and display backlights increase the power consumption of the unit. To conserve battery life, Troxler recommends that the backlights be used only when necessary.

To conserve power, the PaveTracker Plus provides a *sleep* mode, as well as an automatic shutdown. If no key is pressed for five minutes, the gauge enters *sleep* mode. In *sleep* mode, the display and keypad backlights, and most of the electronics are turned off, but all data and gauge settings are protected. To exit *sleep* mode, press any key. If no key is pressed for 60 minutes, the gauge shuts down automatically.

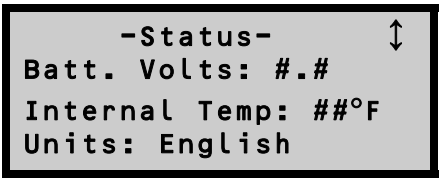
NOTE

If the gauge goes into *sleep* mode while in the *continuous* measurement mode (see page 2–16), the display returns to the Ready screen. In *averaging* or *segregation* mode, the gauge maintains its current state when it enters *sleep* mode.

The gauge software monitors the battery voltage. If the voltage falls below 6.0 V dc, the gauge displays a low battery symbol (🔋) in the upper right of the **Ready** screen. Recharge the batteries as described on page A–4. After charging, the battery voltage should be between 6.8 and 7.2 V dc. If the voltage falls below 5.5 V dc, the gauge powers down automatically after completing any memory store functions already in progress.

STATUS

The gauge **Status** display enables the operator to view gauge status information, including the battery voltage, internal temperature, selected measurement units (see page 2–8), and the time and date of the last reference reading (see page 4–2). To access this information, press the ⟨**STATUS**⟩ key. The gauge displays:



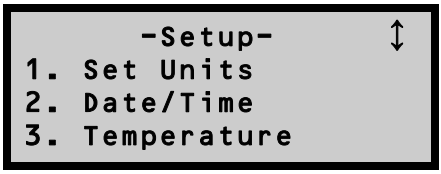
To scroll through the displays, use the up and down arrow keys. Return to the **Ready** screen by pressing the ⟨**ESC**⟩ key.

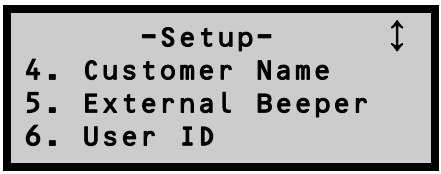
SETUP MENU

After turning the gauge on for the first time, set up the software. The gauge stores the software setup, so the operator does not need to enter a new setup each time the gauge is turned on.

The gauge *setup* includes the measurement units (*Metric* or *English*), date and time, temperature, customer name, external beeper setup, user ID, mix calibration, and the layer thickness function.

To access the **Setup** menu, press the ⟨**SETUP**⟩ key. The gauge displays:



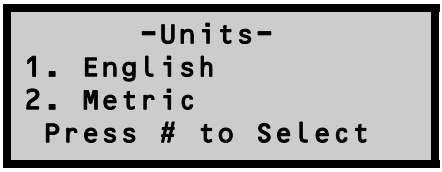


To scroll through the **Setup** menu, use the arrow keys (screens that have options the operator can scroll through are indicated with the up/down arrow symbol in the upper right corner of the screen). To select a menu option, use the numeric key that corresponds to the option. To return to the **Ready** screen, press the ⟨**ESC**⟩ key.

The remainder of this section provides details on the setup options.

SET UNITS

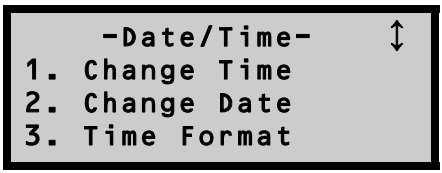
The gauge can display measurement results in either metric (SI) or English units. To set the units, press ⟨**1**⟩ at the **Setup** menu shown on page 2–7. The gauge displays:



Select the desired measurement units by pressing the corresponding numeric key. The gauge displays the new units, then returns to the **Setup** menu.

DATE/TIME

The *Date/Time* function allows the operator to change the date and time, and to select the display format for each. To access the **Date/Time** menu, press ⟨**2**⟩ at the **Setup** menu shown on page 2–7. The gauge displays the **Date/Time** menu:



From this screen, the operator may change the time, date, or time/date display format. Use the up and down arrows to scroll between the menu options. To select a menu option, press the corresponding numeric key. To return to the **Setup** menu, press the ⟨**ESC**⟩ key.

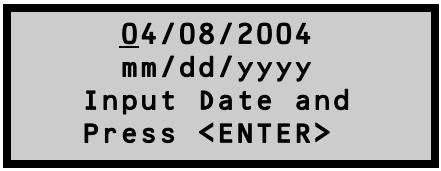
Change Time

To change the time, press ⟨**1**⟩ at the **Date/Time** menu. The gauge displays:

(Note that in this example, the time is displayed in *AM/PM* format. To change the format, see the *Time Format* section on page 2–10.) To accept the displayed time, press ⟨**ENTER/START**⟩. To change the time, use the numeric keys to enter the new time, and the arrow keys to toggle between *AM* and *PM*. Press ⟨**ENTER/START**⟩. The gauge sets the time and returns to the **Date/Time** menu.

Change Date

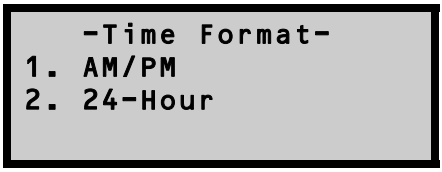
To change the date, press ⟨**2**⟩ at the **Date/Time** menu. The gauge displays:



(Note that in this example, the time is displayed in *mm/dd/yyyy* format. To change the date format, refer to the *Date Format* section on page 2–10.) To accept the displayed date, press ⟨**ENTER/START**⟩. To change the date, use the numeric keys to enter the new date. When finished, press ⟨**ENTER/START**⟩. The gauge sets the date and returns to the **Date/Time** menu.

Time Format

The gauge can display the time in either *AM/PM* or *24-hour* format. To select the desired time format, press ⟨**3**⟩ at the **Date/Time** menu. The gauge displays:



Use the numeric keys to select the desired time format. The gauge sets the time format and returns to the **Date/Time** menu.

Date Format

The gauge can display the date in either *mm/dd/yyyy* or *dd/mm/yyyy* format, where *mm* = month, *dd* = day, and *yyyy* = year. To select the desired date format, press ⟨**4**⟩ at the **Date/Time** menu. The gauge displays:

Use the numeric keys to select the desired format. The gauge sets the date format and returns to the **Date/Time** menu.

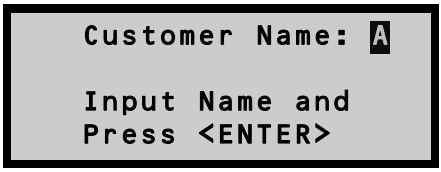
TEMPERATURE (OPTIONAL)

An infrared sensor that measures the temperature of the mat is available as an option for the gauge. If this option is installed, press ⟨**3**⟩ at the **Setup** menu shown on page 2–7 to display the temperature reading. Press the ⟨**ESC**⟩ key to return to the **Setup** menu.

CUSTOMER NAME

The Model 2701-B can store a customer name of up to 12 characters. To enter a customer name, press ⟨**4**⟩ at the **Setup** menu shown on page 2–7. The gauge displays the current customer name on the second line.

To change the customer name, press ⟨**YES**⟩. The gauge displays:

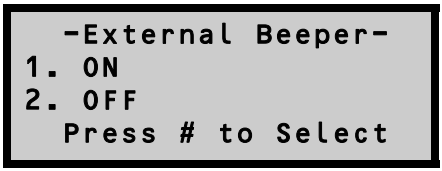


Press the ⟨**ALPHA LOCK**⟩ key to enable the alphabetic keys on the gauge. When the alphabetic keys are enabled, the symbol **A** appears in the upper right of the display, as shown above.

Enter the new name and press the ⟨**ENTER/START**⟩ key. The gauge stores the new customer name, then returns to the **Setup** menu.

EXTERNAL BEEPER

The PaveTracker Plus is equipped with an external beeper mounted on its underside. The external beeper can be enabled or disabled as desired. To control the external beeper, press ⟨**5**⟩ on the **Setup** menu shown on page 2–7. The gauge displays:

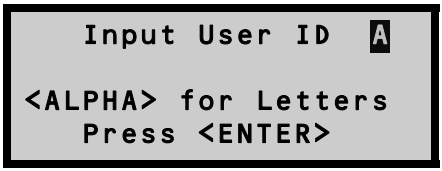


Press ⟨**1**⟩ to enable the external beeper or ⟨**2**⟩ to disable it. The gauge sets the external beeper function to the desired state, displays a brief confirmation message, and returns to the **Setup** menu.

USER ID

The PaveTracker Plus stores a three-character *user ID* with each measurement. To enter or change the user ID, press ⟨**6**⟩ on the **Setup** menu shown on page 2–7. The gauge displays:

To change the user ID, press ⟨**YES**⟩. The gauge displays:



Press the ⟨**ALPHA LOCK**⟩ key to enable the alphabetic keys on the gauge. When the alphabetic keys are enabled, the symbol **A** appears in the upper right of the display, as shown above.

Enter the new user ID and press ⟨**ENTER/START**⟩. The gauge stores the new user ID and returns to the **Setup** menu.

MIX CALIBRATION

The *Mix Calibration* function is used to adjust gauge measurements, as described on page 3–6.

LAYER THICKNESS

The *Layer Thickness* function enables the operator to enter the thickness of the material being measured. When this function is enabled, the gauge prompts the operator to enter a thickness value when creating a new *project* as described on page 5–4. The layer thickness value is then stored along with other measurement data in the active project.

To enable or disable the *Layer Thickness* function, press ⟨**8**⟩ on the **Setup** menu shown on page 2–7. The gauge displays:

```
  Thickness Option
1. ON
2. OFF
 Press # to Select
```

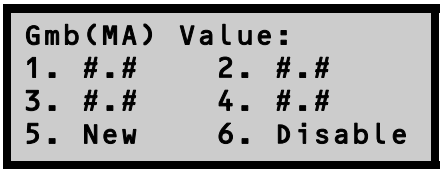
Press ⟨**1**⟩ to enable the *Layer Thickness* function or ⟨**2**⟩ to disable it. The gauge sets the function to the desired state, displays a brief confirmation message, and returns to the **Setup** menu.

TARGET

The Model 2701-B can store up to four *Gmb* (Marshall) and four *Gmm* (Voidless density) target values. A Gmb value is the bulk density of a material, often determined using the Marshall method. A Gmm value is the maximum theoretical density for a test material as obtained in laboratory tests. The gauge uses target values to determine the percent compaction and/or percent voids (if a Gmm value is entered) as compared to the measured density of the test material.

With the *Target* function, the operator can enter a new target value, enable a stored target value, or disable a target value. To access the *Target* function, press the ⟨**TARGET**⟩ key. The gauge displays the **Target** menu:

To enter, enable, or disable a Gmb (Marshall) or Gmm (Voidless density) value, press the corresponding numeric key. For example, to edit the Gmb (Marshall) value, press ⟨**1**⟩. The gauge displays the **Gmb(MA) Value:** menu shown below. The **Gmm(Void) Value:** menu is similar and operates in the same manner.



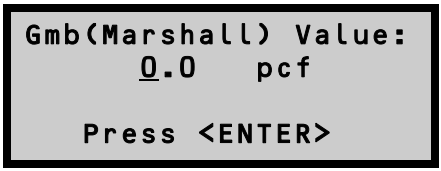
The target value menu shows the four stored target values (if any) and the *New* and *Disable* options.

ENABLE A TARGET VALUE

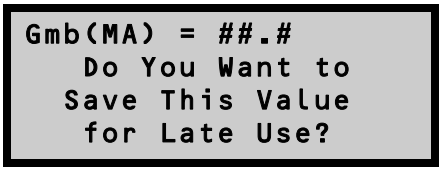
To enable a displayed target value, press the corresponding numeric key on the target value menu. The gauge enables the target value and returns to the **Ready** screen.

ENTER A NEW TARGET VALUE

To enter a new target value, press ⟨**5**⟩ at the target value menu. The gauge displays:

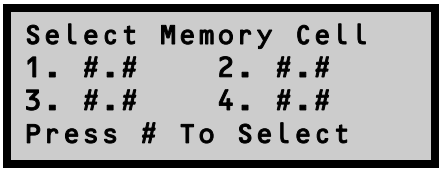


Use the numeric and decimal keys to enter the target value. Press the ⟨**ENTER/START**⟩ key. The gauge displays:



To store the value, press the ⟨**YES**⟩ key. To use the value now without storing it for later use, press the ⟨**NO**⟩ key.

If the operator presses the ⟨**YES**⟩ key to store the target value, the gauge displays:



The gauge can store the target value in one of four *memory cells*. Use the numeric keys to store the target value. Note that this will replace any target value that was previously stored in the memory cell. The gauge enables the target value, displays a brief confirmation message and returns to the **Ready** screen.

DISABLE THE TARGET VALUE

To disable the current target value, press ⟨**6**⟩ at the target value menu. The gauge disables the target value, displays a brief confirmation message, and returns to the **Ready** screen.

MODE

The Model 2701-B provides three measurement modes:

- In *continuous* mode, the gauge takes a measurement and updates the display every second. This mode is used for typical quality control measurements.

- In *averaging* mode, the operator can take up to 30 measurements at selected locations. The gauge then calculates the average of the measurements. This mode enables the operator to determine the average density over a selected area. The *Store* function (see page 5–10) records the most recent results screen when in this mode.

- In *segregation* mode, the operator can take up to 30 measurements at selected locations. The gauge then displays the high, low, and average density of the readings. This mode enables the operator to determine the degree of segregation in the area being measured. The *Store* function (see page 5–10) records the most recent results screen when in this mode.

Before taking a measurement, select the appropriate measurement mode. To select a measurement mode, press the ⟨**MODE**⟩ key. The gauge displays:

```
      -MODE-
1. Continuous
2. Averaging
3. Segregation
```

Press the numeric key that corresponds to the desired measurement mode. The gauge enables the selected mode, displays a brief confirmation message, and returns to the **Ready** display.

CHAPTER 3

ADJUSTING MEASUREMENTS

This chapter explains how to adjust gauge measurements using density offsets and mix calibration (slope and intercept) values for a particular material.

CONTENTS

Introduction 3–2

Offset 3–3
- Determining the Density Offset 3–3
- Managing Density Offsets 3–4

Mix Calibration 3–6
- Enable a Mix Calibration 3–6
- New Mix Calibration 3–7
- Disable the Mix Calibration 3–10

INTRODUCTION

As described on page 4–2, Troxler recommends taking a reference reading each day that the gauge will be used, and periodically while taking measurements. The reference reading consists of placing the gauge on the reference standard contained in the gauge carrying case and pressing the ⟨**Ref**⟩ key. The density read by the gauge is then compared to the known density of the reference standard. The result of this comparison is used to automatically adjust gauge measurements.

For increased accuracy, measurements can be adjusted using *density offset* and *mix calibration* values described in the following sections.

To determine the density offset, take a gauge reading and compare the measured value to an *alternative density value*, as measured by another method (such as using a nuclear gauge or extraction and analysis of a road core).

For a given material, the slope and intercept values can also be determined using the *Mix Calibration* function (see page 3–6).

OFFSET

To improve the accuracy of the PaveTracker Plus for a specific material of known density, the unit can be calibrated using a density offset. A density offset is determined by taking in-place measurements using the PaveTracker Plus, then comparing the *measured density* to an *alternative density*, as determined using a nuclear gauge reading or road core extraction and analysis.

DETERMINING THE DENSITY OFFSET

To determine the density offset for a given material:

1. Take a reference reading using the PaveTracker Plus as described on page 4–2.

   NOTE

   Before using the PaveTracker Plus, inspect the protective cover of the bottom surface of the gauge's sensor. Ensure that the cover is in good condition, and has no deep scratches or buildup of material. If necessary, replace the cover as described on page A–7.

2. Measure the in-place density of the material using the PaveTracker Plus to find the *measured density*. Mark the test site so that nuclear gauge readings or core extraction can be conducted in the same location. If the core has already been removed, take the measurement as close as possible to the core location.

   NOTE

   When taking PaveTracker Plus measurement *on* a core site, be sure to take measurements *before* the core is cut, as the water used during the core cutting process may affect PaveTracker Plus measurements.

3. Determine the *alternative density* of the material using a nuclear gauge reading or road core extraction and analysis. Be sure to conduct the gauge measurements or core extraction in the same location as the PaveTracker Plus reading.

4. Subtract the measured density from the alternative density to determine the density offset to be entered into the PaveTracker Plus software. For example, if the density as determined by a core analysis is *150 pcf*, and the density measured by PaveTracker Plus is *146 pcf*, the density offset is *+4 pcf*.

NOTE

For best results, repeat the above procedure to determine the density offset at each of several in-place locations. Then calculate the *average* density offset.

MANAGING DENSITY OFFSETS

Density offsets are managed using the **Density Offset** menu. To access this menu, press ⟨**OFFSET**⟩. The gauge displays:

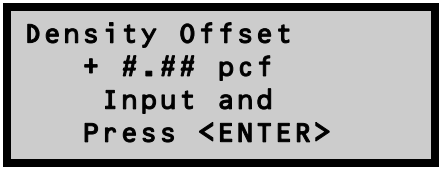
```
  Density Offset
    #.## pcf
1-Enable   2-Disable
3-Change Offset
```

The gauge displays the current density offset on the second line. To enable the offset, press ⟨**1**⟩. To disable the offset, press ⟨**2**⟩.

To enter a new density offset, press ⟨**3**⟩. The gauge prompts for the density offset as shown below:

```
  Density Offset
    #.## pcf
   Select (+/-)
```

To change the offset, use the arrow keys to select the offset sign (positive or negative). The gauge displays:



Enter the density offset as determined from the procedure on page 3–3 and press ⟨**ENTER/START**⟩. The gauge enables the new offset and returns to the **Ready** screen.

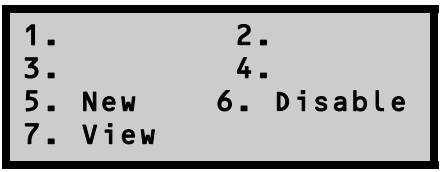
MIX CALIBRATION

As noted earlier, the PaveTracker Plus can be calibrated for a specific mix using the *Mix Calibration* function. To use this function, the operator takes gauge measurements at three to ten locations across the material. The gauge compares these values to values obtained by core analysis or another method to determine a *slope* and *intercept* for that particular material. The gauge can store up to four mix calibrations.

NOTE

In order for the gauge to calculate both a slope and an intercept for the test material, measurements must be performed at a minimum of three locations. Also, the difference between the minimum and maximum reading must be at least 3 pcf. For best results, Troxler recommends taking measurements at seven to ten locations.

To access the *Mix Calibration* function, press ⟨**7**⟩ on the **Setup** menu shown on page 2–7. The gauge displays:



Selections **1** through **4** show the mix calibrations that have been stored previously. Use the numeric keys to enable an existing mix calibration, create a new calibration, disable an active calibration, or view a calibration.

ENABLE A MIX CALIBRATION

To enable a displayed mix calibration, press the corresponding numeric key. The gauge enables the mix calibration and returns to the **Setup** menu.

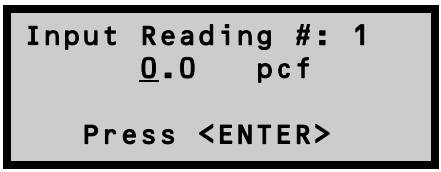
NEW MIX CALIBRATION

To determine a new mix calibration or to manually enter the slope and intercept values, press ⟨**5**⟩ on the menu shown on page 3–6. The gauge displays:

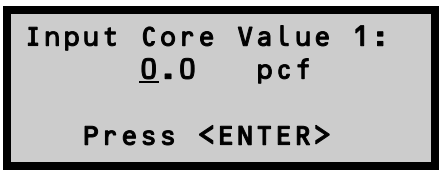
To determine a new mix calibration based on gauge measurements and values determined by an alternate method, press ⟨**1**⟩ to access the *Data Pairs* function. To enter slope and intercept values manually, press ⟨**2**⟩ to access the *Slope/Intercept* function. These functions are described in the following sections.

Data Pairs

To determine a new mix calibration based on gauge measurements and values determined by an alternate method, press ⟨**1**⟩ at the **Entry Method** menu shown above. The gauge displays:

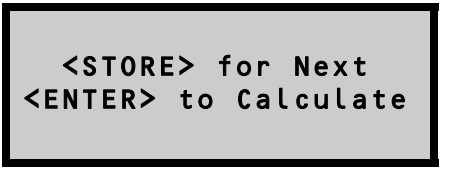


Using the numeric and decimal keys, enter the *measured density* (the density as measured by the gauge) at the first test location. Press the ⟨**ENTER/START**⟩ key. The gauge displays:



Enter the *actual density* (the density as determined from an alternate method) and press the ⟨**ENTER/START**⟩ key.

The gauge displays:

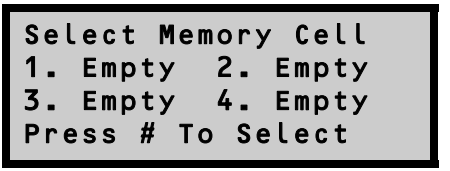


Press the ⟨**STORE**⟩ key to store the values and to enter those for the next location. When the measured and actual densities for each location have been entered, press the ⟨**ENTER/START**⟩ key to calculate the mix calibration. The gauge displays:

To return to the **Setup** menu without saving the mix calibration, press the ⟨**NO**⟩ key. To save the mix calibration, press the ⟨**YES**⟩ key. The gauge requests a mix calibration ID as shown:

Press the ⟨**ALPHA LOCK**⟩ key to enable the alphabetic keys on the gauge. When the alphabetic keys are enabled, the symbol **A** appears in the upper right of the display, as shown above.

Enter a unique mix calibration ID and press ⟨**ENTER/START**⟩. The gauge displays:



The gauge can store the mix calibration in one of four *memory cells*. Use the numeric keys to store the mix calibration. Note that this will replace any mix calibration that was previously stored in that cell.

The gauge enables the mix calibration, displays a brief confirmation message, and returns to the **Setup** menu.

Slope/Intercept

The *Slope/Intercept* function is used to manually enter the slope and/or intercept for a particular material. These values can be determined using the *Data Pairs* function described on page 3–7, or can be calculated manually.

To access the *Slope/Intercept* function, press ⟨**2**⟩ on the **Entry Method** menu shown on page 3–7. The gauge prompts for the slope and intercept values. Press ⟨**ENTER/START**⟩ after each value is entered. After both values have been entered, the gauge displays:

```
    Slope = #.##
Intercept = ###.#
Do you want to
accept this mix?
```

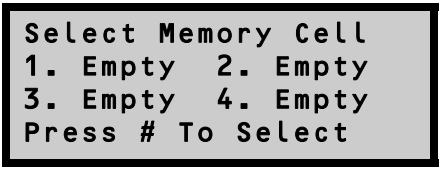
To return to the **Setup** menu without saving the mix calibration, press the ⟨**NO**⟩ key. To save the mix calibration, press the ⟨**YES**⟩ key. The gauge requests a mix calibration ID as shown:

```
   Mix Calib. ID

<ALPHA> for Letters
   Press <ENTER>
```

Press the ⟨**ALPHA LOCK**⟩ key to enable the alphabetic keys on the gauge. When the alphabetic keys are enabled, the symbol **A** appears in the upper right of the display, as shown above.

Enter a unique mix calibration ID and press ⟨**ENTER/START**⟩. The gauge displays:



The gauge can store the mix calibration in one of four *memory cells*. Use the numeric keys to store the mix calibration. Note that this will replace any mix calibration that was previously stored in that cell.

The gauge enables the mix calibration, displays a brief confirmation message, and returns to the **Setup** menu.

DISABLE THE MIX CALIBRATION

To disable the current mix calibration, press ⟨**6**⟩ at the mix calibration menu. The gauge disables the mix calibration, displays a brief confirmation message, and returns to the **Setup** menu.

CHAPTER 4

USING THE GAUGE

This chapter explains the basic use of the Model 2701-B PaveTracker Plus. Basic use includes taking a reference reading, preparing measurement sites, setting the measurement mode, and taking measurements.

CONTENTS

Taking a Reference Reading 4–2

Preparing a Test Site 4–4

Taking Measurements 4–5
- Continuous Mode 4–6
- Averaging Mode 4–7
- Segregation Mode 4–9

Recall 4–12

TAKING A REFERENCE READING

To ensure the accuracy of gauge measurements, Troxler recommends that a reference reading be taken each time the gauge is powered on, and periodically while taking measurements. A reference reading consists of taking a density measurement on a material of known density. The gauge then compares the reading to the known value and uses the result of that comparison to adjust future gauge readings.

NOTE

A reference standard, built into the gauge carrying case, is provided for this purpose. Always take reference readings using the reference standard in the carrying case provided with the specific unit.

Turn the gauge on as described on page 2–4. At the **Ready** screen, press the ⟨**REF**⟩ key. The gauge displays:

Place the gauge on the reference standard (in the carrying case). Ensure that the circular sensor on the bottom of the gauge is centered between the four locating pins inside the case, and that the sensor rests flat against the surface.

Press the ⟨**ENTER/START**⟩ key to begin the reference reading. Upon completion, the gauge displays:

Press the ⟨**ENTER/START**⟩ key to continue. The gauge stores the result of the reading and returns to the **Ready** screen. The result is then used to adjust all gauge readings.

NOTE

If the reference reading is out of range and the gauge displays an error message, check the following:

- **Ensure that the circular sensor cover is firmly in place on the gauge sensor (press firmly around the perimeter of the cover).**
- **Ensure that the cover and reference standard are totally clean and free of any asphalt residue, moisture, or debris. Clean with WD-40 or other suitable means.**
- **Ensure that the sensor cover is seated flat and flush on the reference standard, within the four locating pins, with the gauge in the case.**

Repeat the reference reading. If the reference reading still does not pass, contact Troxler technical support (see page A–10).

To verify that the gauge is still accurate during use, perform the following check:

- **Ensure that the gauge is turned on and in measurement mode.**
- **Turn off (disable) all operator-installed density offsets and mix calibrations. See Chapter 3 for specifics.**
- **Place the gauge on the reference standard and verify that it reads within ± 0.5 pcf (±8 kg/m^3) of the actual density value stamped on the reference standard. If the reading is outside these limits, take a reference reading as described in this section to adjust the gauge.**

Note that each reference standard is unique to that individual gauge. Use care to not intermix different gauges and cases.

PREPARING A TEST SITE

To ensure measurement accuracy, properly prepare the test site before taking gauge measurements.

✓ Locate a smooth site on the asphalt.

✓ To ensure accurate readings, the gauge sensor must be completely in contact with the test material. If the gauge rocks, then find a more suitable test site. If taking a measurement around a core, the gauge may be moved a few inches away from the core to level it.

TAKING MEASUREMENTS

The *Status* feature (see page 2–6) allows the operator to view the current gauge status. This feature provides a quick overview of the battery voltage, internal temperature, selected measurement units, and the date and time of the last reference reading. If necessary, check the gauge's current status before taking measurements.

NOTE

To ensure the accuracy of gauge measurements, take a reference reading each day the gauge is to be used (see page 4–2) and periodically while taking measurements.

As described on page 2–16, the PaveTracker Plus provides three measurement modes: *continuous*, *averaging*, and *segregation*. Before taking a measurement, select the appropriate measurement mode.

CAUTION

High internal temperatures may damage the gauge's electronic components. To reduce the risk of damage, DO NOT allow the gauge to sit on hot asphalt for extended periods.

If the internal temperature of the gauge reaches a level that is considered excessive, the beeper will sound and the warning message Internal temp. high Allow gauge to cool will be displayed. The gauge should be taken to a shady or air-conditioned environment and allowed to cool before continuing. If measurements are performed before the gauge is allowed to cool, the warning symbol ! is displayed.

CAUTION

The gauge includes a replaceable protective cover that protects the bottom surface of the gauge's sensor assembly against wear and provides thermal protection for the gauge's internal components. To prevent damage to the gauge, DO NOT operate the gauge without the protective cover.

NOTE

Before using the gauge, inspect the protective cover of the bottom surface of the gauge's sensor. Ensure that the cover is in good condition, and has no deep scratches or buildup of material. If necessary, replace the cover as described on page A–7.

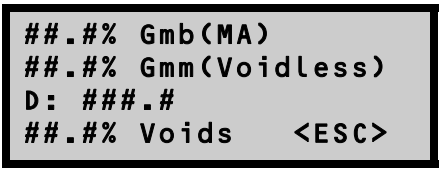
CONTINUOUS MODE

In *continuous* mode, the gauge takes a measurement and updates the display every second. This mode is used for typical quality control measurements.

Extend the telescoping handle (see Figure 1–1) to reduce the bending required while taking measurements.

To take a measurement in *continuous* mode, select the mode as described on page 2–16. Place the gauge on the test site and press ⟨**ENTER/START**⟩.

The gauge displays the measurement results, updated every second, as shown:



NOTE

If the *Temperature* option (see page 2–10) is installed, the mat temperature is also shown in the upper right corner of the display.

Press ⟨**ESC**⟩ to return to the **Ready** screen.

For more information on storing measured data, see the *Storing Data* section on page 5–8.

NOTE

If the gauge goes into *sleep* mode while in the *continuous* measurement mode (see page 2–16), the display returns to the Ready screen. To exit *sleep* mode and continue taking measurements, press the ⟨ENTER/START⟩ key.

AVERAGING MODE

In *averaging* mode, the operator can take up to 30 measurements at selected locations. The gauge then calculates the average of the measurements. This mode enables the operator to determine the average density over a larger area.

Extend the telescoping handle (see Figure 1–1) to reduce the bending required while taking measurements.

To take a measurement in *averaging* mode, select the mode as described on page 2–16.

Press the ⟨**ENTER/START**⟩ key. The gauge displays:

Place the gauge on the first test site and press ⟨**ENTER/START**⟩. The gauge takes a measurement, then displays the results:

NOTE

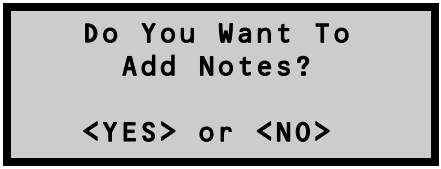
If the *Temperature* option (see page 2–10) is installed, the mat temperature is also shown in the upper right corner of the display.

Press ⟨**ENTER/START**⟩ to continue. Repeat the steps above to take a measurement at up to 30 test locations. When all locations are complete, press the ⟨**STORE**⟩ or ⟨**ESC**⟩ key to continue.

If the ⟨**ESC**⟩ key is pressed, the gauge displays:

Press ⟨**NO**⟩ to return to the **Ready** screen without storing the results or ⟨**YES**⟩ to continue as described below.

If the ⟨**STORE**⟩ key is pressed at the end of the measurements (or if the operator presses ⟨**ESC**⟩ then ⟨**YES**⟩), the gauge displays:



When storing test results, the gauge can also store project notes, such as location information, with the measurement data. To include project notes, press ⟨**YES**⟩. The gauge displays:

Enter any desired information (up to eight characters) and press ⟨**ENTER/START**⟩. The gauge stores the *last displayed* results and notes under the active project and returns to the **Ready** screen. For more information on storing measured data, see the *Storing Data* section on page 5–8.

NOTE

The gauge stores only the data shown in the *last display*. It does not store the results of each individual reading.

SEGREGATION MODE

In *segregation* mode, the operator can take up to 30 measurements at selected locations. The gauge then displays the high, low, and average density of the readings. This mode enables the operator to determine if there is a large degree of segregation in the area being measured.

Extend the telescoping handle (see Figure 1–1) to reduce the bending required while taking measurements.

To take a measurement in *segregation* mode, select the mode as described on page 2–16.

Press the ⟨**ENTER/START**⟩ key. The gauge displays:

```
  Segregation Mode
Reading #:  1
   Press <START>
<STORE>/<ESC> to End
```

Place the gauge on the first test site and press ⟨**ENTER/START**⟩. The gauge takes a measurement, then displays the results:

```
Avg D: ##.#
 Hi D: ##.#
Low D: ##.#
  Den: ##.#  <ENTER>
```

NOTE

If the *Temperature* option (see page 2–10) is installed, the mat temperature is also shown in the upper right corner of the display.

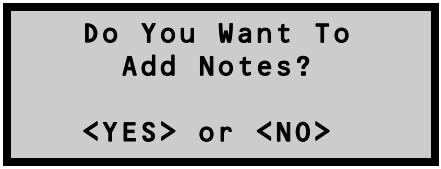
Press ⟨**ENTER/START**⟩ to continue. Repeat the previous steps to take a measurement at up to 30 test locations. When all locations are complete, press the ⟨**STORE**⟩ or ⟨**ESC**⟩ key to continue.

If the ⟨**ESC**⟩ key is pressed, the gauge displays:

```
End of Measurement
  Do You Want To
     Store ?
  <YES> or <NO>
```

Press ⟨**NO**⟩ to return to the **Ready** screen without storing the results or ⟨**YES**⟩ to continue as described below.

If the ⟨**STORE**⟩ key is pressed at the end of the measurements (or if the operator presses ⟨**ESC**⟩ then ⟨**YES**⟩), the gauge displays:



When storing test results, the gauge can also store project notes, such as location information, with the measurement data. To include project notes, press ⟨**YES**⟩. The gauge displays:

Enter any desired information (up to eight characters) and press ⟨**ENTER/START**⟩. The gauge stores the *last displayed* results and notes under the active project and returns to the **Ready** screen. For more information on storing measured data, see the *Storing Data* section on page 5–8.

NOTE

The gauge stores only the data shown in the *last display*. It does not store the results of each individual reading.

RECALL

To view the results of the most recent measurement, press the ⟨**RECALL**⟩ key from the **Ready** screen. The gauge displays the results of the most recent measurement. To return to the **Ready** screen, press the ⟨**ENTER/START**⟩ key.

CHAPTER 5

PROJECT DATA

The Model 2701-B PaveTracker Plus allows unique project names to be entered into the gauge memory. Subsequent measurements can then be stored under these project names. This chapter describes how to handle project data.

CONTENTS

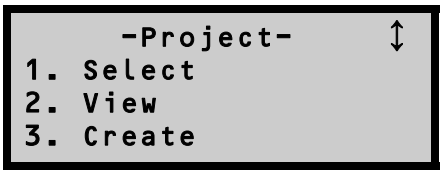
Handling Project Data 5–2
- Select 5–2
- View 5–3
- Create a Project 5–4
- Erase Projects 5–5
- Output Project Data 5–5

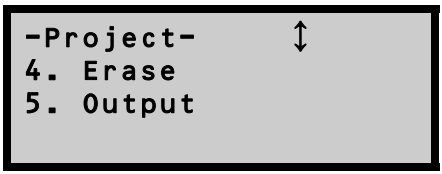
Storing Data 5–8
- Continuous Mode 5–9
- Averaging or Segregation Mode 5–10

HANDLING PROJECT DATA

The Model 2701-B can store approximately 1000 readings. The *Project* and *Store* functions allow handling of measurement data. Measurement results are stored in files (memory locations) called *projects*, which are named by the operator. The *Project* function allows the operator to create a new project, view project data, select a project (make an existing project active so that additional data may be added to it), output the data stored in the project, or erase projects. The *Store* function allows the operator to store measurement results and other test-identifying information in a selected project. Refer to page 5–8 for information on the *Store* function.

To access the *Project* function, press the ⟨**PROJ**⟩ key. The gauge displays the **Project** menu:





Use the arrow keys to scroll through the menu options. Use the numeric keys to select a menu option. Press ⟨**ESC**⟩ to return to the **Ready** screen.

SELECT

To select an existing project, press ⟨**1**⟩ at the **Project** menu shown above. If no projects have been created, the gauge displays the message **No Projects are stored.**

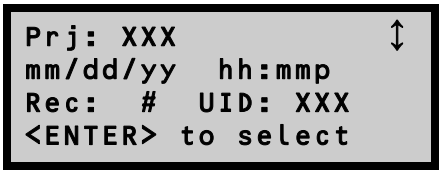
If a project has been created, the gauge displays:

Use the arrow keys to scroll through the names of the existing projects. Press ⟨**ENTER/START**⟩ when the desired project is displayed. The gauge sets the selected project as active, briefly displays a confirmation message, and returns to the **Project** menu.

VIEW

The Model 2701-B offers two methods of viewing data. The operator can either view the last measurement results using the *Recall* function described on page 4–12, or any measurement results, including project notes, stored in a project file using the *View* function available from the **Project** menu.

To view data stored in a project file, press ⟨**2**⟩ at the **Project** menu. The gauge displays:

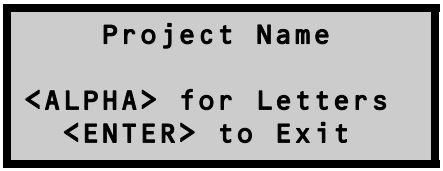


Use the arrow keys to scroll through the project names. Press ⟨**ENTER/START**⟩, when the gauge displays the desired project name. If any measurement data has been stored in the selected project file, the gauge displays the data for the first measurement. Five screens of information are displayed for each measurement. Use the up and down arrows to scroll through the project data.

Press the ⟨**ESC**⟩ key to return to the project selection screen shown above.

CREATE A PROJECT

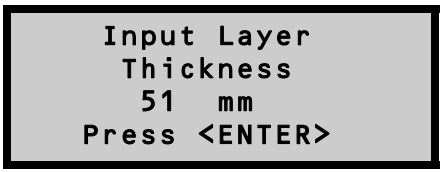
To create a new project, press ⟨**3**⟩ at the **Project** menu shown on page 5–2. The gauge displays:



Press the ⟨**ALPHA LOCK**⟩ key to enable the alphabetic keys on the gauge. When the alphabetic keys are enabled, the symbol **A** appears in the upper right of the display, as shown above.

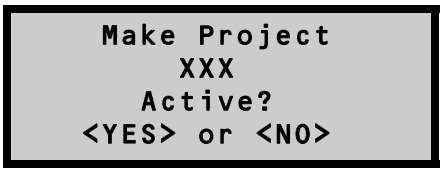
Enter the project name (up to twelve characters) and press the ⟨**ENTER/START**⟩ key.

If the *Layer Thickness* function (see page 2–13) is enabled, the gauge prompts for the layer thickness:



Enter a layer thickness from 25 to 102 mm (2.0 to 4.0 in.) and press the ⟨**ENTER/START**⟩ key.

The gauge displays:



To enable the new project, press the ⟨**YES**⟩ key. The gauge enables the new project, displays a brief confirmation message, and returns to the **Project** menu.

ERASE PROJECTS

To erase either a selected project file or all project files, press ⟨**4**⟩ at the **Project** menu shown on page 5–2. The gauge displays:

To erase a single project, press ⟨**1**⟩. If more than one project has been created, the gauge displays:

Use the arrow keys to scroll through the project names displayed on the first line. When the gauge displays the desired project, press ⟨**ENTER/START**⟩. At the **Are you sure?** prompt, press the ⟨**YES**⟩ key. The gauge erases the project and returns to the **Project** menu.

To erase all projects, press ⟨**2**⟩ at the **Erase** menu. At the **Are You Sure?** prompt, press the ⟨**YES**⟩ key. The gauge erases all the projects and returns to the **Project** menu.

OUTPUT PROJECT DATA

The *Output* function within the **Project** menu allows the operator to print (or upload) project data stored in the gauge to a printer or computer.

To output project data, connect a serial cable to the 9-pin serial port on the front of the gauge. Ensure that the serial cable meets the pinout shown on page C–3. An optional serial cable, PN 106514.0002, is available from Troxler. Connect the serial cable to the printer (or computer) serial port.

NOTE

To upload data to a computer, use the HyperTerminal® application available from the Windows® Accessories menu. This application can be used to transfer data from the gauge to the computer.

At the **Project** menu shown on page 5–2, press ⟨**5**⟩. The gauge displays the **Output** menu:

```
Output:
1. One Project
2. All Projects
 Press # to Select
```

From this menu, the gauge can print (or upload) either a single project or all projects.

To output a single project, press ⟨**1**⟩. The gauge displays:

```
Prj: XXX              ↕

  Arrows for Scroll
 <ENTER> to Select
```

Use the arrow keys to scroll through the project names displayed on the first line. When the gauge displays the desired project, press ⟨**ENTER/START**⟩.

To output the data from all projects, press ⟨**2**⟩.

For either selection, the gauge displays:

```
Output:
1. 32 Column Report
2. Spreadsheet
 Press # to Select
```

The *32 Column Report* option is formatted for a standard printer width. This format is recommended when outputting the data to a printer. The *Spreadsheet* option is sent in a *comma-delimited* format, which can then be imported easily into a spreadsheet program, such as Microsoft Excel®. The information output using the *Spreadsheet* option is shown on page 5–8.

The gauge prints (or uploads) the project and returns to the *Project* menu shown on page 5–2. Press the ⟨**ESC**⟩ key to return to the *Ready* screen.

STORING DATA

The Model 2701-B can store approximately 1000 readings. As described in the previous section, the gauge stores readings under the project name that has been enabled. For more information on selecting a project, see page 5–2.

Project data can be output as described on page 5–5. When using the *Spreadsheet* option, the gauge outputs the following information for each reading:

- *Project name*
- *Layer Thickness* – This value is displayed only if the *Layer Thickness* function is enabled.
- *Record number*
- *Measurement time*
- *Measurement date*
- *Measurement mode*
- *Gmb (Marshall)* – This value is 0.0 if the Gmb (Marshall) target is 0.0.
- *Gmm (Voidless)* – This value is 0.0 if the Gmm (Voidless) target is 0.0.
- *Density measurement*
- *Low density* – This value is 0.0 if not in *segregation* mode.
- *High density* – This value is 0.0 if not in *segregation* mode.
- *Air voids* – This value is 0.0 if Gmm (Voidless) target is 0.0.
- *Slope*
- *Offset*
- *Gmb (Marshall) target*
- *Gmm (Voidless) target*
- *Mat temperature* – This value is 0 if the *Temperature* option (see page 2–10) is not installed.
- *Station ID*
- *User ID*
- *Location (right or left) of centerline* – This value is blank if not in *continuous* mode.
- *Distance from centerline* – This value is 0.0 if not in *continuous* mode.

Note that the station number, distance from centerline, and location with respect to centerline fields are available only for *continuous* mode measurements.

CONTINUOUS MODE

When taking measurements in *continuous* mode, the operator can store the data in the selected project by pressing the ⟨**STORE**⟩ key at any time when the gauge is displaying measurement data, or after returning to the **Ready** screen. The gauge displays:

```
Do You Want To
  Add Notes?

<YES> or <NO>
```

- Press ⟨**NO**⟩ to store only the measurement results under the active project and return to the previous screen.

- Press ⟨**YES**⟩ to store the station number, distance from centerline, and location with respect to centerline project notes along with the measurement. The gauge displays:

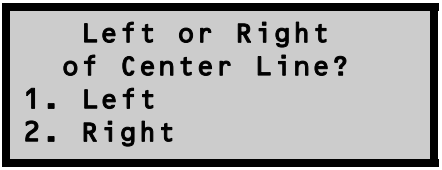
```
Input Station #


 Press <ENTER>
```

  Enter the station number (up to eight characters) and press ⟨**ENTER/START**⟩. The gauge displays:

```
 Station Distance
From Center Line?
     #.#  ft
 Press <ENTER>
```

Enter the distance from the centerline and press ⟨**ENTER/START**⟩. The gauge displays:

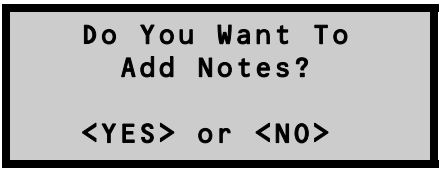


Press ⟨**1**⟩ if the station was to the left of the centerline or ⟨**2**⟩ if the station was to the right.

The gauge stores the measurement data and notes under the selected project and returns to the previous screen.

AVERAGING OR SEGREGATION MODE

After taking a measurement in *averaging* or *segregation* mode, the operator can store the data in the selected project by pressing the ⟨**STORE**⟩ key when the gauge displays the test results or after returning to the **Ready** screen. The gauge displays:



- Press ⟨**NO**⟩ to store only the measurement results under the active project and return to the previous screen.

- Press ⟨**YES**⟩ to include project notes along with the measurements results. The gauge displays:

Enter any desired information (up to eight characters) and press ⟨**ENTER/START**⟩. The gauge stores the test results and notes under the active project and returns to the previous screen.

APPENDIX A

TROUBLESHOOTING AND SERVICE

This appendix provides details for troubleshooting and servicing the Model 2701-B PaveTracker Plus. For further details, call the nearest Troxler Service Center or representative.

CONTENTS

Troubleshooting A–2

Internal Gauge Temperature A–3

Batteries A–4
- Charging A–4
- Replacing the Batteries A–5

Cleaning the Base and Top Shell A–6

Replacing the Protective Cover A–7

Replacement Parts A–8
- Accessories A–8
- Options A–8

Returning the Gauge for Service A–9

Troxler Service Centers A–10

TROUBLESHOOTING

GAUGE WILL NOT COMMUNICATE WITH PRINTER OR COMPUTER

✓ Check that the correct cable is being used.

✓ Ensure that the printer/computer baud rate is 9,600 bps.

✓ Ensure that all other parameters match:

- Data bits = 8
- Stop bits = 2
- Parity = none
- Protocol = DSR/DTR

GAUGE TURNS OFF AFTER IT IS TURNED ON

✓ To conserve power, the gauge provides an automatic shutdown if no key is pressed for 60 minutes. To turn the gauge on, press the power switch.

✓ If the rechargeable NiMH battery pack is below 5.5 V dc, the gauge shuts down. Recharge or replace the batteries (see page A–4).

SHORT BATTERY LIFE AFTER RECHARGING

✓ NiMH batteries may be charged up to 500 or more full charge/discharge cycles, and typically have a 4-year life. The batteries may be reaching the end of their life cycle, and should be replaced.

✓ Charger/adapter may not be supplying full charge – check the ac outlet and the dc output (12 V dc) using a voltmeter on the proper setting.

✓ Check that you are using the correct charger.

✓ The ac charger may be defective. To check, use the dc adapter to charge the batteries.

INTERNAL GAUGE TEMPERATURE

High internal temperatures may damage the gauge's electronic components. **To reduce the risk of damage, DO NOT allow the gauge to sit on hot asphalt for extended periods.**

If the internal temperature of the gauge reaches a level that is considered excessive, the beeper will sound and the following warning message is displayed:

```
Internal temp. high
Allow gauge to cool
Press Enter to
resume
```

The gauge should be taken to a shaded or air-conditioned environment and allowed to cool before continuing. If measurements are performed before the gauge is allowed to cool, the warning symbol **!** is displayed.

BATTERIES

The PaveTracker Plus is equipped with one set of rechargeable nickel-metal hydride (NiMH) batteries (pack of five C batteries). The gauge software monitors the NiMH battery voltage. When the batteries are fully charged, the battery voltage should be between 6.8 and 7.2 V dc. If the voltage falls below 6.0 V dc, the gauge displays a low battery symbol (▯) in the upper right of the **Ready** screen. Recharge the batteries as described below.

If the voltage falls below 5.5 V dc, the gauge powers down automatically after completing any memory store functions already in progress. Troxler recommends that the operator recharge the NiMH batteries. The NiMH batteries can be fully recharged in only 2.5 hours.

CHARGING

To charge the NiMH batteries, plug the charger into the round jack on the front of the gauge. Plug the other end of the ac charger into a standard 100–240 V ac outlet.

The dc adapter may be connected to any 12-14 V dc source (such as a vehicle's cigarette lighter). To ensure a full charge, charge the batteries for at least 2.5 hours. After charging, the battery voltage should be between 6.8 and 7.2 V dc.

After recharging the batteries, unplug the charger from both the wall outlet and the gauge. Store the charger for later use.

REPLACING THE BATTERIES

To replace the NiMH battery pack (PN 110374):

- ✓ Turn the gauge off.
- ✓ Using a 1/8-inch Allen wrench, remove the two screws that secure the battery cover to the base of the unit.
- ✓ Clean the screws and set them aside.
- ✓ Carefully lift the old NiMH battery pack from the gauge.
- ✓ Unplug the battery cable from the battery connection on the top circuit board. Gently squeeze the connector to disconnect.
- ✓ Plug the battery cable for the new NiMH battery pack into the battery connection on the top circuit board.
- ✓ Slide the battery pack into the gauge.
- ✓ Replace the battery cover and replace the two screws.

CLEANING THE BASE AND TOP SHELL

To clean the gauge base, use a putty knife to scrape away any built-up accumulations of soil or asphalt. **Be careful not to scrape or scratch the round sensor, as damage to the sensor may cause erroneous readings. Also be careful not to damage the gauge base.**

After removing any large accumulations, wipe the gauge base with a cloth soaked in an adhesive remover (such as Goo Gone®), then wipe with alcohol to remove the remaining debris.

The keypad may be cleaned using a mild soap (such as 409™ or Fantastic™), followed by clean water.

The Model 2701-B gauge top shell is manufactured from an engineering thermoplastic designed specifically to provide high impact strength and to offer excellent compatibility with many industrial solvents and petro-chemicals. The top shell may be cleaned with mild (low alkaline) soap and water. Other approved cleaning substances include: methyl, isopropyl, or isobutyl alcohols. A cloth dampened with kerosene or diesel fuel may be used to remove heavy soils. **Avoid prolonged exposure and do not soak.**

CAUTION

The use of any unapproved cleaning agents such as methyl-ethyl-ketones, amines, and methylene chloride will damage the top shell and void the warranty.

REPLACING THE PROTECTIVE COVER

The gauge includes a replaceable, adhesive-backed bottom cover disc that protects the bottom surface of the gauge's sensor assembly against wear and provides thermal protection for the gauge's internal components. The protective cover disc adheres to the rear base assembly. When the disc becomes worn, it should be replaced as described below.

CAUTION

To prevent damage to the gauge, DO NOT operate the gauge without the protective cover disc.

NOTE

Additional bottom cover discs can be purchased from Troxler by ordering PN 113103, Cover Replacement Kit, which includes three discs.

To remove the old protective cover disc:

- ✓ Turn the gauge over so that its bottom surface is exposed. To prevent damage to the keypad or display, place the gauge on a soft surface.
- ✓ Using a knife or other flat object, gently lift the edge of the disc. After loosening, peel the cover off by hand.

To install the replacement protective cover disc:

- ✓ Clean the surface of the sensor with alcohol (used sparingly) and allow the surface to dry.
- ✓ Peel the adhesive backing from the replacement protective cover disc.
- ✓ Align the replacement cover disc with the sensor and press it into place. Smooth out the disc to eliminate air bubbles.

NOTE

Do not remove and re-install the same cover disc, as the adhesive will be weakened.

REPLACEMENT PARTS

PART #	DESCRIPTION
113210	Handle assembly, L shaped
113006	Locking pin
113034	Transit case assembly
113103	Bottom cover replacement kit (includes three replacement bottom cover discs)
110374	NiMH battery assembly

ACCESSORIES

PART #	DESCRIPTION
104156	DC charger
110403	AC adapter
106514.0002	Serial cable
113045	Model 2701-B *Manual of Operation and Instruction*

OPTIONS

PART #	DESCRIPTION
113017	Handle assembly, telescoping

RETURNING THE GAUGE FOR SERVICE

All shipments within the United States to the factory must be accompanied by the following information. This information is used by Troxler shipping and service personnel to expedite the repair work.

- Gauge model and serial number.
- Part number/serial number (if applicable).
- Is the gauge still under warranty?
- Problem or difficulty you are having with the instrument.
- Shipment method to Troxler and for return shipment.
- Shipping and billing address (not P.O. Box) – street address and zip code.
- Telephone number and contact (for questions from Troxler).
- Will estimate be required before performing any work on the gauge?
- Payment method: credit card, account number, or purchase order number. All U.S. government agencies (city, county, state and federal) must send purchase order numbers.

NOTE

To prevent order duplication, if an order has been placed by telephone, please write "Confirming Order" on any follow-up written requests.

TROXLER SERVICE CENTERS

Troxler Corporate Headquarters
3008 Cornwallis Road
P.O. Box 12057
Research Triangle Park, NC 27709 U.S.A.
Phone: 1.877.TROXLER (1.877.876.9537)
Outside the U.S.A.: +1.919.549.8661
Fax: +1.919.549.0761
Web: www.troxlerlabs.com

Technical Support
Phone: 1.877.TROXLER (1.877.876.9537)
E-mail: TroxTechSupport@troxlerlabs.com

Midwestern Branch Office
1430 Brook Drive
Downers Grove, IL 60515
Fax: 630.261.9341

Florida Service Center
2376 Forsyth Road
Orlando, FL 32807
Fax: 407.681.3188

Western Regional Branch Office
11300 Sanders Drive, Suite 7
Rancho Cordova, CA 95742
Fax: 916.631.0541

Troxler European Subsidiary
Troxler Electronics GmbH
Gilchinger Strasse 33
D.82239 Alling nr. Munich, Germany
Phone: ++49.8141.71063
Fax: ++49.8141.80731
E-mail: troxler@t-online.de

Southwestern Branch Office
2016 East Randol Mill Road
Suite 406
Arlington, TX 76011
Fax: 817.275.8562

NOTE

To locate an independent, Troxler-authorized service center near you, call 1.877.TROXLER (1.877.876.9537).

APPENDIX B

MENU MAP

This appendix provides a map of the various menus in the Model 2701-B PaveTracker Plus control software.

CONTENTS

Menu Map Description B–2

MENU MAP DESCRIPTION

Figure B–1 is a map of the menus of the PaveTracker Plus control software and each of its submenus.

The menu map shows the function key that accesses each menu. The map uses indentation to indicate submenus that result from selection of a menu item. For example, the first seven lines of Figure B–1 are:

```
⟨PROJ⟩
-Project-
1. Select
2. View
3. Create
4. Erase
    Erase
    1. One Project
    2. All Projects
```

This indicates that, by pressing the ⟨**PROJ**⟩ key, the operator accesses the **Project** menu. The first three items under the **Project** menu (**1. Select**, **2. View**, and **3. Create**) have no submenus. The fourth item (**4. Erase**) does have a submenu. Press ⟨**4**⟩ to access the **Erase** submenu.

NOTE

The menu map contains only the displays that allow or require a keypad selection from multiple choices. Other displays (such as status information, confirmation messages, data entry screens, or error displays) are not included.

Figure B–1. Model 2701-B Menu Map

⟨**PROJ**⟩
-Project-
1. Select
2. View
3. Create
4. Erase
    Erase:
    1. One Project
    2. All Projects
5. Output
    Output:
    1. One Project
    2. All Projects

⟨**SETUP**⟩
-Setup-
1. Set Units
    -Units-
    1. English
    2. Metric
2. Date/Time
    -Date/Time-
    1. Change Time
    2. Change Date
    3. Time Format
        -Time Format-
        1. AM/PM
        2. 24-Hour
    4. Date Format
        -Date Format-
        1. mm/dd/yyyy
        2. dd/mm/yyyy
3. Temperature
4. Customer Name
5. Beeper
    External Beeper
    1. ON
    2. OFF

Figure B–1. Model 2701-B Menu Map (Continued)

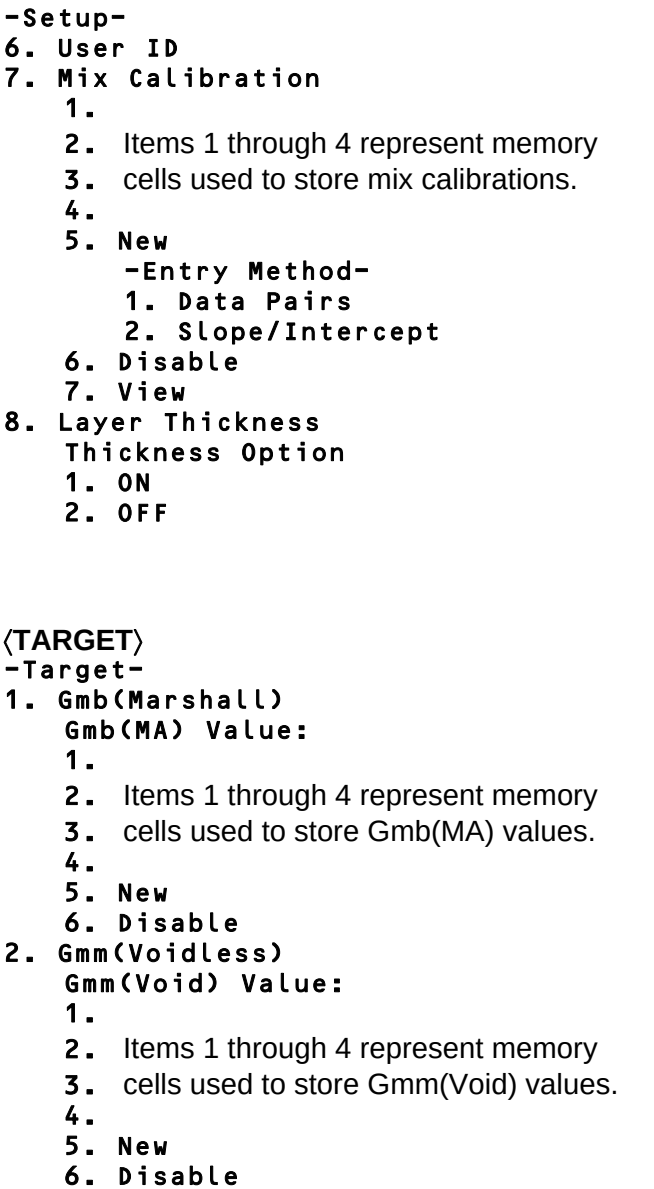


Figure B–1. Model 2701-B Menu Map (Continued)

⟨**MODE**⟩
-Mode-
1. Continuous
2. Averaging
3. Segregation

⟨**OFFSET**⟩
Density Offset
1. Enable
2. Disable
3. Change Offset

NOTES

APPENDIX C

MODEL 2701-B SPECIFICATIONS

This appendix contains gauge and measurement specifications for the Model 2701-B PaveTracker Plus.

CONTENTS

Measurement Specifications C–2

Electrical Specifications C–3

Mechanical Specifications C–4

MEASUREMENT SPECIFICATIONS

Measurement capability	Pavement density in lb/ft^3 and kg/m^3
Precision	0.2 lb/ft^3 (3.2 kg/m^3) at 1-Sigma on reference standard
Probe	Non-nuclear, non-capacitance, measuring field
Probing depth	Up to 4.45 cm (1.75 in.)
Measurement time	1 second
Measurement modes	Continuous, averaging, and segregation

ELECTRICAL SPECIFICATIONS

Power Source	5 C NiMH (Rechargeable Pack) batteries
Charging Source	
Power Supply (AC charger)	100–240 V ac, 47–63 Hz, 0.7 A
PaveTracker Plus	12 V dc ± 5%, 1.8 A minimum
Battery Recharge Time	2.5 hours maximum, automatic cutoff (may be charged incrementally without damaging the batteries)
Default Time Before *Sleep* Mode	5 minutes between keypresses, no loss of data or previous status
Time Before Automatic Shutdown	60 minutes of complete inactivity
Liquid Crystal Display	Alphanumeric, 4 line × 20 characters, backlit
Keypad	30-key sealed membrane, backlit
Serial Data Format	8 data bits, 1 stop bit, No parity
Baud rate	9,600 bps

Serial Cable Pinout (PN 106514.0002)

9 pin FEMALE	**9 pin FEMALE**
Rx (pin 2)	Tx (pin 3)
Tx (pin 3)	Rx (pin 2)
DTR (pin 4)	DSR (pin 6)
DSR (pin 6)	DTR (pin 4)
RTS (pin 7)	CTS (pin 8)
CTS (pin 8)	RTS (pin 7)
Gnd (pin 5)	Gnd (pin 5)

MECHANICAL SPECIFICATIONS

Gauge Size, Without Telescoping Handle	22.9 W × 40.6 D × 19.1 H cm (9.0 W × 16.0 D × 7.5 H in.)
Carrying Case Size	54.0 W × 45.1 D × 26.7 H cm (21.25 W × 17.75 D × 10.5 H in.)
Weight, Without Telescoping Handle	4.8 kg (10.5 lb)
Shipping Weight	13.7 kg (30.1 lb)
Operating Temperature (Ambient)	0 to 70 °C 32 to 158 °F
Max Test Material Surface Temperature	150 °C (302 °F)
Storage Temperature	–55 to 85 °C (–67 to 185 °F)
Humidity	98%, noncondensing

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